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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Process for Reducing Migration of Dressing of Spinning Spools

We, AACHEN-GERRESHEIMER TEXTILGLAS G.M.B.H.—GEVETEX, a German Joint Stock Company, of Theaterstrasse 8, Aix la Chapelle, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

In the production of continuous filaments of glass, a filament is drawn at high speed, say 150 feet per second, from a nozzle with up to 800 apertures with the aid of a rotating spool and before it is wound on the spool it is dressed, usually with an organic dressing.

After winding, the spinning spool contains about 6 to 10% of water since the dressing is applied in the form of an aqueous solution, dispersion or emulsion. But a spinning spool which has such a high water content is difficult to spool off. Further, after the glass filament has been process into yarn or twist it should only contain 1% of water at most so that when stored it will not be attacked by mould for which the organic dressing is an ideal nutrient. The finer types of filament lose their excess water partly while they are stored for a certain time as a spinning spool, but mostly during twisting. Coarser filaments require a more or less prolonged storage time as a spinning spool in order that their water content may be below 1% after twisting. The drying time for the spinning spool depends on the denier and on the dressing used and is usually from 10 to 16 hours, but for some filament deniers and dressings it may be as much as from 48 to 72 hours.

During this drying, which usually takes place in an ordinary room atmosphere or in a drying oven with circulating air, part of the water evaporates from the surface of the spinning spool and the water content is reduced there. The water from the interior of the spinning spool migrates to the outside in the form of liquid and in addition it carries some of the solid substance contained in the dressing with it to the surface of the spool. This is termed migration. The longer the drying process lasts the more dressing will be carried from the interior of the spool to its surface. The content in dressing may be up to 100% greater on the surface of the spool than the average content for the whole spool.

Thus spinning spools all manifest some of migration when they reach the twisting stage. This migration greatly impairs the quality of the glass silk yarn or twist because only a particular dressing content imparts the best qualities to the yarn or twist. In addition, the dressing content influences the colour of the yarn or twist, with the result that fabrics produced from them can be streaky.

Difficulties also arise in removing the dressing from fabrics. This removal of dressing is usually done by heat treatment which reduces the strength of the fabric. To remove the dressing adequately from those areas of the fabric which have a considerably higher dressing content, the heat treatment of the whole fabric must be extended or the temperature increased, which results in even greater loss in strength.

An object of the invention is to reduce migration of the dressing so as to avoid the above-mentioned disadvantages.

To solve this problem, the process according to the invention is characterised in that a dressed filament, especially a glass filament, is wound on a sleeve of heat-resistant material which is elastically yielding in the radial direction, the filament being then dried by means of a high frequency field.

The time required for drying the filament

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down to a water content of less than 1% is only 2 to 3 minutes in the process of the invention. Since water is driven off over the whole cross-section of the spool in the form of steam, in contrast to drying in air where the water can only evaporate from the surface of the spool, the migration of dressing is largely prevented. The removal of steam is further facilitated by the use of a corrugated sleeve since the troughs of the corrugation constitute channels along which the steam can escape.

The invention will be described in more detail by way of example with reference to the accompanying drawings in which:—

Figures 1 and 2 are graphs, whose abscissae represent quantity of dressing and whose ordinates represent filament length;

Figure 3 is a side elevation of a sleeve;

Figure 4 is a top plan of a sleeve;

Figure 5 is a diagrammatic side view of apparatus for carrying out the process of the invention; and

Figure 6 is a longitudinal section through a spool in a high frequency field.

The curves of Figures 1 and 2 show to what extent the migration of the dressing can be prevented by rapid drying in a high frequency oven, in accordance with the invention.

In Figure 1, curve 1 represents the content of dry dressing of a spool having a total filament length of about 25,000 m, an elementary filament diameter of 9μ and a denier of Nm 15, treated with a textile dressing based on starch, after drying for 60 hours at room temperature. Curve 2 of Figure 1 shows a spool of the same material but dried by high frequency immediately after it was produced. It will be seen that both spools have a higher dressing content at the beginning and end of the spool. As described above, the increase in dressing content is due to evaporation of the water from the surface of the spool. In the second spool only a small amount of water could evaporate from the surface, curve 2, with the result that at the beginning of the spool the dressing content was lower than in the case of the spool dried at room temperature, curve 1. The end of the spool also shows a lower dressing content. However, the important particulars are not only the start and the finish, but also the differences between the two filaments in the region of the first 4000 m.

In Figure 2, curve 3 represents the content of dry dressing on a spool which had been built up in the same way as the spools used in Figure 1 except that it had a denier of Nm 30. Like the spool of curve 1, the spool 3 was dried for 60 hours at room temperature. The spool of curve 4 was made in the same way as the spool of curve 3 but was dried immediately in a high frequency field. A comparison of curves 3 and 4 also reveals the higher dressing content at the beginning and end of the spool dried at room temperature.

Drying of spools in a high frequency oven has hitherto not been possible because the steam produced in the interior of the spool near the mounting sleeve when the spool was dried by means of a high frequency field burst the sleeve, hitherto usually made of paper or synthetic resin, and smooth, so entangling the different layers of filaments. By using a sleeve which is elastically resilient in the radial direction, especially a corrugated sleeve made of a material with high heat resistance, e.g. a synthetic resin such as polypropylene, the drying of spools in a high frequency oven has become possible, since a sleeve formed in this way can efficiently take up the steam pressure produced during drying owing to its elastic construction and can also withstand the relatively high temperatures which occur. To ensure that the package cannot slide off the sleeve after drying, the sleeve is fitted with cam projections on its lower, and preferably also on its upper, edge.

Another advantage of such a corrugated sleeve is that it will yield in the corrugations under the effect of the radial forces produced by winding up the filament, with the result that the wound package remains round and will not implode as is the case with smooth sleeves which would make spooling off difficult due to imbalance and would interefere with the subsequent twisting process.

Referring now to Figure 5, a high frequency drying plant consists of a shielded inlet 1, a chamber 2 and a shielded outlet 3. An electrically earthed conveyor belt 4, constituting a second electrode, on which spinning spools 5 on sleeves 6 (Figure 3) are placed upright, runs through all the three parts. The chamber 2 contains a first electrode 8 which is adjustable in height in the direction of arrow 7 to vary the spacing between the electrodes. The spacing can be adjusted to any value from 25 cm to 50 cm.

The spinning spools are dried under the influence of the HF field by the heat of friction of the polar molecules which are moved at the high frequency. The quantity of heat produced depends on the frequency of the alternating field and on the voltage which is supplied to the electrode 8 and the belt 4, between which the spinning spools 5 are dried.

The uptake of energy by the material to be dried and the load on the generator depend on the quantity of water which must be evaporated. The speed of the belt 4 or the rate at which the belt is charged with material to be dried must be adjusted to the amount of load which the HF generator can take.

The high frequency drying plant includes an overload protection device which, at the maximum permissible load on the generator, switches off the conveyor belt drive. The load on the generator then falls because no further material to be dried is supplied. When the load has dropped slightly, the conveyor belt switches itself on again.

The steam produced during drying is sucked off by a ventilator (not shown).

Drying of the spinning spools down to a residual moisture content of about 1% is effected by suitable adjustment of the height of the electrode 8. The required height of the electrode is determined empirically.

The speed of the conveyor belt is usually chosen to be greater than the belt speed at which the generator would be under full load. The reason for this is that the overload protection device is caused to stop the belt regularly, approximately every 10 to 20 seconds, and uniform treatment of all the spools regardless of their weight is thereby ensured. The residual moisture content may be regulated by adjusting the electrode height.

The spinning spools should be placed vertically on the band. This is advisable in any case because it is only in this position that they can be carried without any retaining means. Further, drying is more intense and more economical in this position because the HF field 11 (Figure 6) which is formed between the electrodes extend parallel to the axis of the spool and concentration of the field occurs in the package, as indicated by the lines of force shown.

Figures 3, 4 and 6 show cam projections 9 at the upper and lower edges of the spool which are designed to prevent the package from slipping off after drying. 10 and 10′ are corrugations of the sleeve 6. If desired the spool may be perforated.

WHAT WE CLAIM IS:—

1. Process for reducing migration of dressing in spinning spools in the production of filaments, especialy glass filaments, wherein dressed filament is wound on a sleeve of heat resistant material which is elastically resilient in the radial direction, the filament being then dried by means of a high frequency field.

2. Process according to claim 1, wherein spinning spools move through the high frequency field with their longitudinal axes approximately parallel to the direction of the field.

3. Process according to claim 1 or claim 2, wherein the spacing between electrodes which produce the high frequency field is adjusted so that at a given speed of a conveyor belt with spools thereon through the field, the moisture content of the spools will not exceed 1% after drying.

4. Process according to claim 1 or claim 2, wherein when electrodes which produce the high frequency field are at a given spacing, the speed of a conveyor belt, which carries spools through the field, is adjusted so that the moisture content of the spools will not exceed 1% after drying.

5. Process according to claim 3 or claim 4 wherein, with the electrodes at a given spacing and/or at a particular speed of the belt, the HF output is adjusted such that the moisture content of the spools will not exceed 1% after drying.

6. Process according to any preceding claim wherein the sleeve is of a heat resistant synthetic resin.

7. Process according to claim 6 wherein the resin is polypropylene.

8. Process according to any preceding claim wherein the sleeve is corrugated longitudinally.

9. Process according to any preceding claim wherein the sleeve has cam projections at its lower edge.

10. Process according to any preceding claim wherein the sleeve has cam projections at its upper edge.

11. Process according to any preceding claim wherein the sleeve is perforated.

12. A process for reducing migration of dressing in spinning spools in the production of glass filaments, substantially as herein described with reference to the accompanying drawings.

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Leamington Spa: Printed for Her Majesty's Stationery Offigs, London, W.C.2, from which copies may be obtained. Published at The Patent Office, 25, Southampton Buildince by the Courier Press.—1966.

FIG.3.

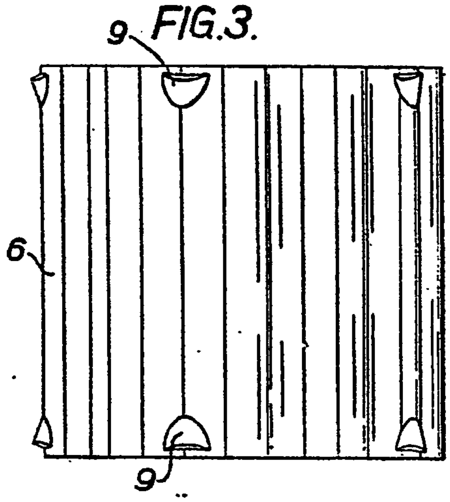

FIG.4.

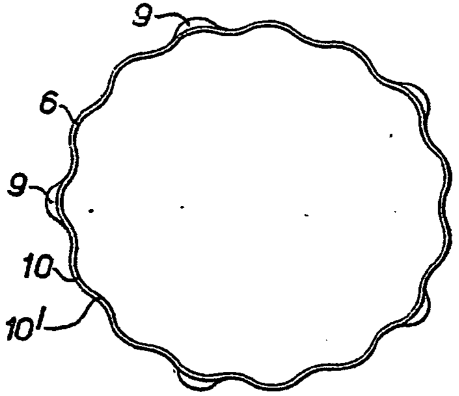

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FIG.6.

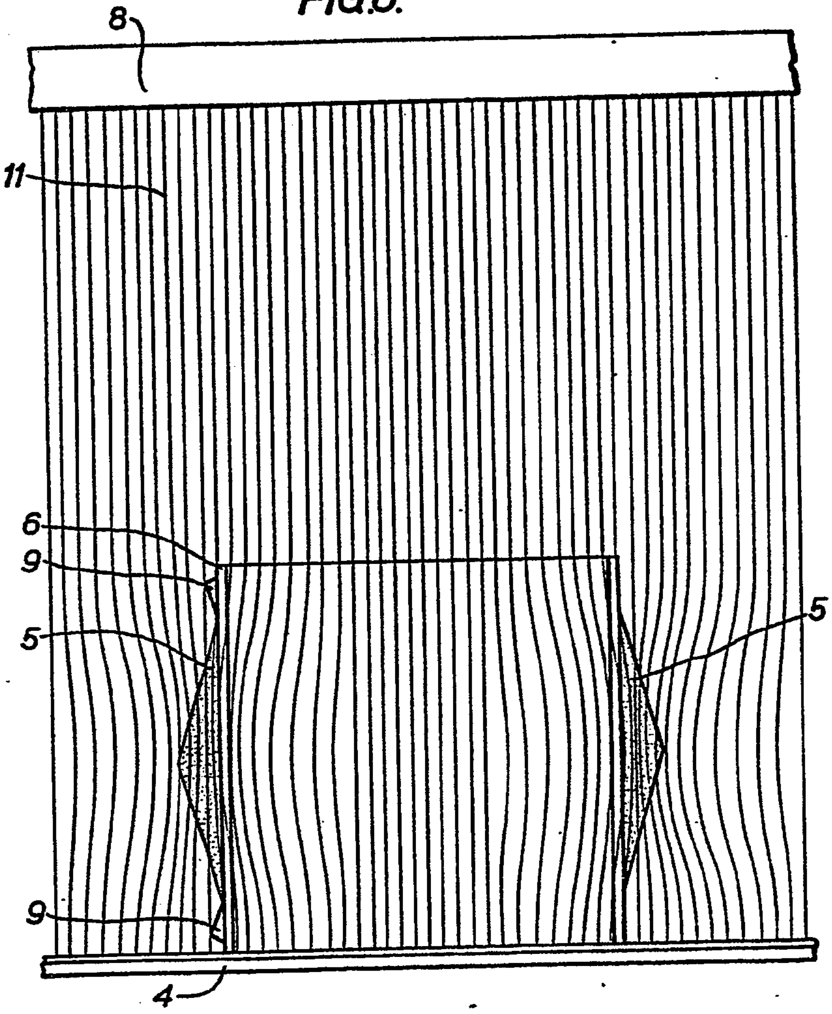

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FIG.3.

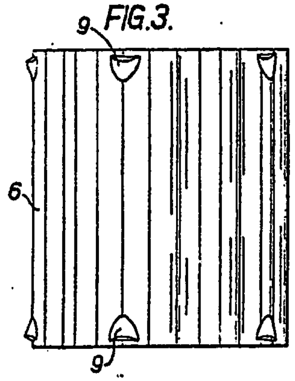


FIG.4.

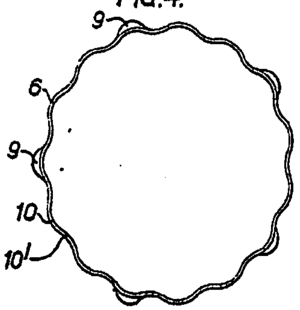
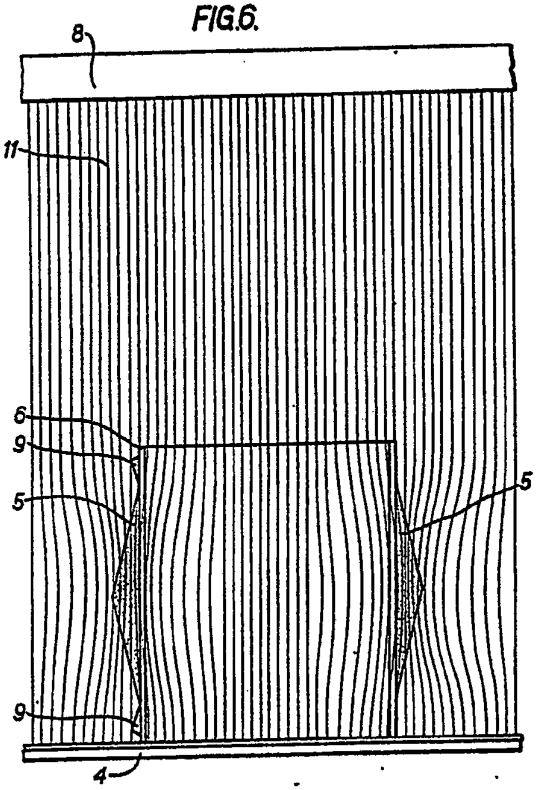


FIG.6.



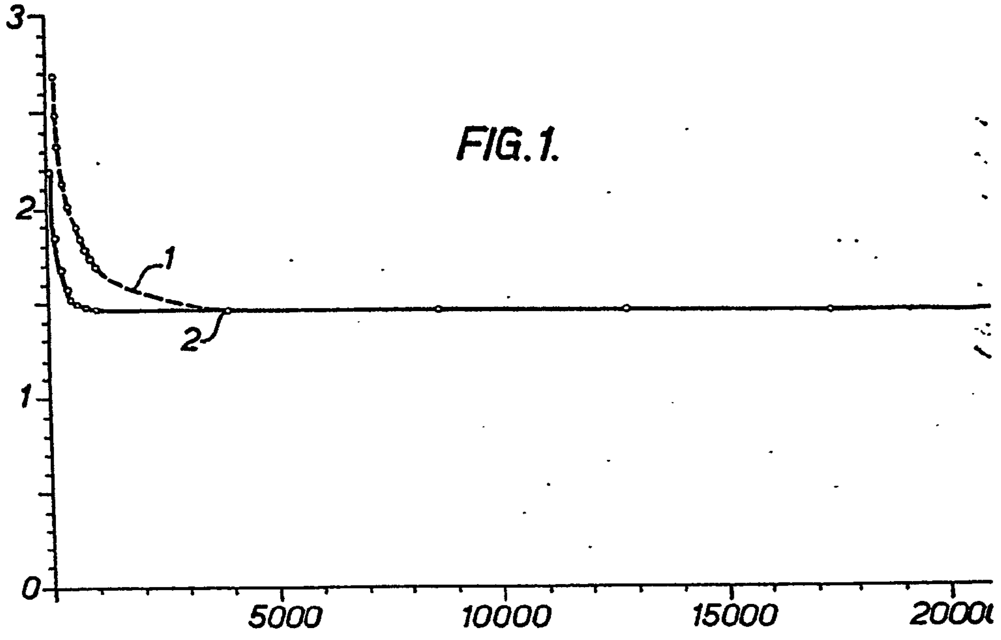


FIG. 1.

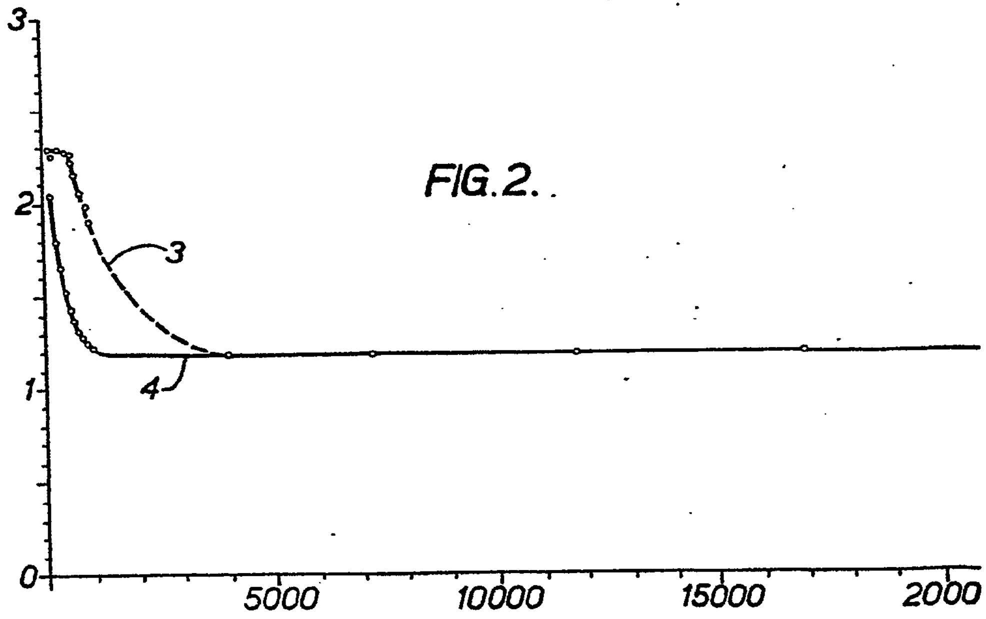


FIG. 2.

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Sheet 3

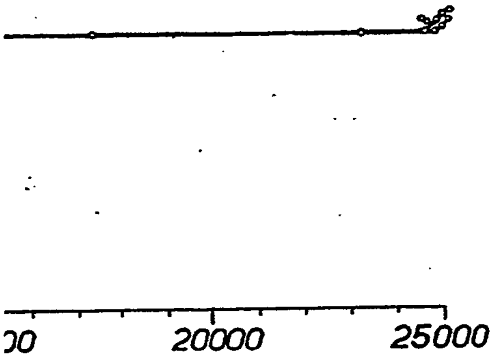
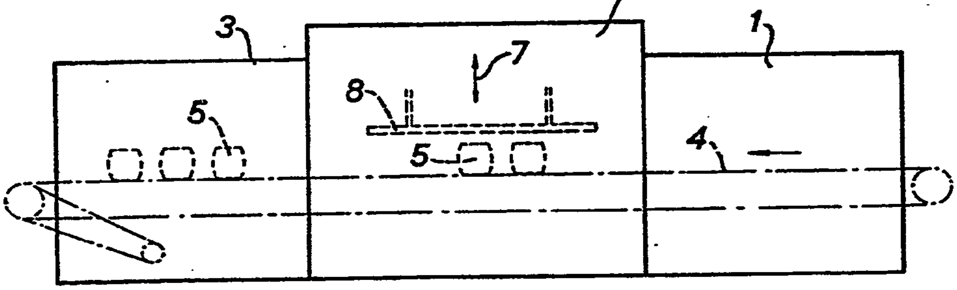
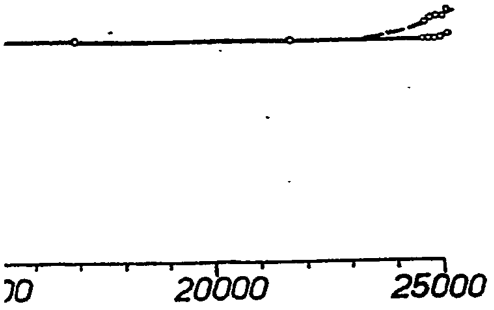


FIG.5.





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Sheet 3

FIG.1.

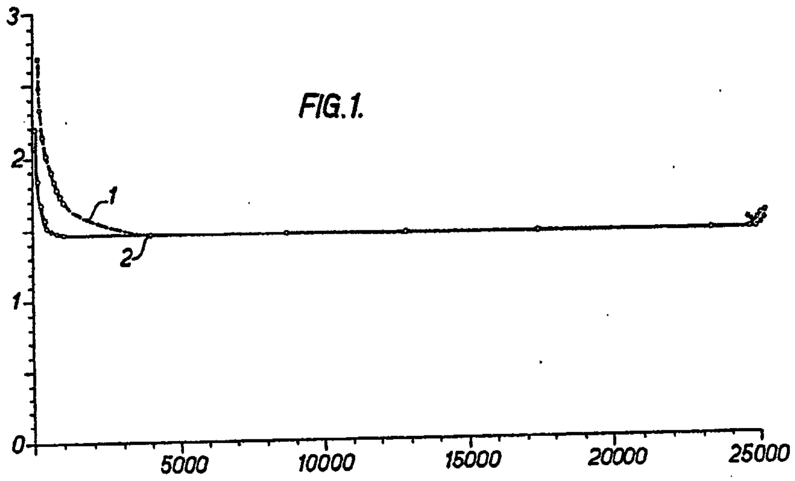


FIG.2.

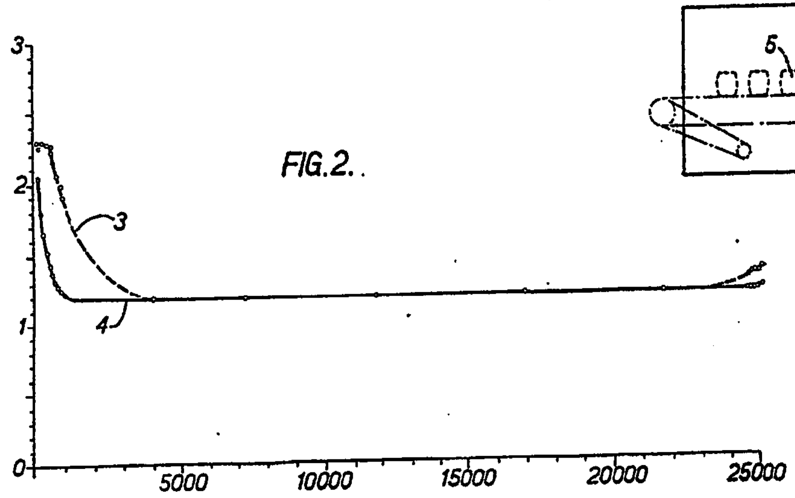
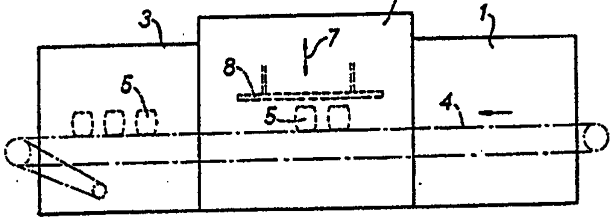


FIG.5.



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